

WHAT IS CLAIMED IS:

1. A shape memory polymer comprising a reaction product of styrene, a vinyl compound other than styrene, a multifunctional crosslinking agent and an initiator.

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2. A shape memory polymer in accordance with Claim 1 wherein said reaction product comprising a modifying polymer.

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3. A shape memory polymer in accordance with Claim 1 wherein said vinyl compound is vinyl neodecanoate, vinyl benzoate, vinyl propionate, vinyl stearate, a methylstyrene, 4-(vinylloxy)butyl stearate or a vinyl pyridine.

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4. A shape memory polymer in accordance with Claim 1 wherein said crosslinking agent is difunctional.

5. A shape memory polymer in accordance with Claim 4 wherein said difunctional crosslinking agent is divinyl benzene, bis(4-(vinylloxy)butyl)terephthalate or bis(4-((vinylloxy)methyl)cyclohexyl)methyl terephthalate.

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6. A shape memory polymer in accordance with Claim 1 wherein said initiator is a free radical initiator or ionic initiator.

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7. A shape memory polymer in accordance with Claim 6 wherein said initiator is a free radical initiator.

8. A shape memory polymer in accordance with Claim 7 wherein said free radical initiator is an organic peroxide.

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9. A shape memory polymer in accordance with Claim 6 wherein said initiator is a cationic initiator.

10. A shape memory polymer in accordance with Claim 2 wherein said modifying polymer is a thermoplastic polymer compatible with said polymer formed by the reaction product of said styrene and said vinyl compound.

11. A shape memory polymer comprising a polymeric reaction product of styrene, a vinyl compound selected from group consisting of vinyl neodecanoate, vinyl benzoate, vinyl propionate, vinyl stearate, a methylstyrene, a vinyl pyridine and 4-(vinylloxy) butyl stearate, a difunctional crosslinking agent and a free radical or a cationic initiator.

12. A shape memory polymer in accordance with Claim 10 wherein said difunctional crosslinking agent is selected from the group consisting of divinyl benzene, bis[4-(vinylloxy)butyl] terephthalate and bis[[4-(vinylloxy)methyl]cyclohexyl]methyl] terephthalate.

13. A shape memory in accordance with Claim 12 wherein said free radical or cationic initiator is selected from the group consisting of t-butyl peroxide, t-butyl hydroxyperoxide, benzoyl peroxide, dicumyl peroxide, lauroyl peroxide, 2,2'-axobisisobutyronitrile, boron trifluoride, boron trifluoride diethyl etherate, aluminum trifluoride and tin (IV) chloride.

14. A shape memory polymer in accordance with Claim 13 wherein said reaction product includes a thermoplastic compatible with the reaction product of said styrene and said vinyl compound.

15. A shape memory polymer in accordance with Claim 13 wherein said thermoplastic is polystyrene or a polyolefin.

16. A shape memory polymer in accordance with Claim 13 wherein said vinyl compound is vinyl neodecanoate, said difunctional crosslinking agent is divinyl benzene and said initiator is selected from the group consisting of dicumyl peroxide, benzoyl peroxide and lauroyl benzene.

17. A shape memory polymer in accordance with Claim 16 wherein said reaction product includes polystyrene.

5 18. A shape memory polymer in accordance with Claim 1 wherein said reaction mixture is polymerized at a temperature in the range of between about 20°C and about 150°C and a pressure in the range of between about 14.7 psi and 50 psi over a time period in the range of between about 2 seconds and about 4 days.

10 19. A shape memory polymer in accordance with Claim 11 wherein said styrene comprises between about 30% and about 95%; said vinyl compound comprises between about 5% and about 60%; said difunctional crosslinking agent comprises between about 0.5% and about 5% and said initiator comprises between about 0.1% and about 4%, said percentages being by weight, based on the total weight of said shape memory polymer
15 reaction mixture.

20 20. A shape memory polymer in accordance with Claim 14 wherein said styrene comprises between about 40% and about 85%; said vinyl compound comprise between about 5% and about 20%; said difunctional crosslinking agent comprises between about 0.6% and about 3%; said initiator comprises between about 0.5% and about 3%; and said thermoplastic comprises between about 5% and about 50%, said percentages being by weight, based on the total weight of said shape memory polymer reaction mixture.